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..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

Urinary incontinence and loneliness in Canadian seniors

by Pamela L. Ramage-Morin and Heather Gilmour

Abstract

Background
Urinary incontinence (UI), a prevalent condition among seniors, can have substantial impacts on quality of life.

Data and methods
Data from the 2008/2009 Canadian Community Health Survey-Healthy Aging were used to examine the prevalence of UI, as well as the relationship between UI and loneliness in a sample of 16,369 people aged 65 or older. Multivariate logistic regression was used to identify significant relationships, while adjusting for potential confounders.

Results
In 2008/2009, an estimated 512,000 seniors reported that they experienced UI. Women were more likely than men to have this complaint (14% versus 9%), as were older seniors. Those with UI were significantly more likely to be lonely than were those without the condition (OR=1.8, 95% CI: 1.5 to 2.0). This association persisted when socio-demographic, social and functional health factors were taken into account (OR=1.5, 95% CI: 1.3 to 1.7).

Interpretation
This study highlights the prevalence of UI among Canadian seniors and its correlation with loneliness, which, itself, is associated with negative health outcomes. Further research is needed to establish exactly how UI has an impact on seniors' feelings of loneliness.

Keywords
Aging, chronic conditions, cross-sectional study, health survey, social participation, quality of life

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Urinary incontinence (UI), defined as involuntary leakage of urine,[1] is associated with reduced quality of life for seniors.[2] Although not life-threatening,[3] UI can have a negative impact on physical, social, and emotional well-being, and add to personal care expenses. People with UI are susceptible to rashes, pressure sores, and urinary tract infections.[4] They may be less likely to engage in activities outside the home such as shopping or attending religious services.[2,5] Intimate relations and psychological well-being may also be compromised.[2,6-8] UI can be associated with a loss of independence, hospitalization, and admission to long-term care health facilities,[9-12] all of which reflect the caregiver burden associated with the condition.[13] The need for home care services, medication and other products may add to personal care expenses.[14]

It is hypothesized that UI may also be related to loneliness, which, itself, has been linked to functional decline and mortality.[15-17] Loneliness is a subjective experience reflecting dissatisfaction with the quantity or quality of social relationships.[18] It indicates discordance between individuals' expected or desired social relationships and what they actually experience.[18] Loneliness may be experienced at any age, although it is a particular concern for seniors. Retirement, loss of spouse or other relationships, loss of health or functional ability, and other changes associated with aging may reduce access to social resources that could help prevent loneliness such as clubs, volunteer groups, places of worship, and public transport. People with UI may voluntarily limit their use of these resources for practical and hygienic reasons, as well as the fear of embarrassment should the condition become obvious.

The aim of this study was to estimate the prevalence of UI and examine the association between UI and loneliness among people aged 65 or older who resided in private households in Canada. Demographic, social and functional health factors that may be related to loneliness were taken into account when examining the relationship between UI and loneliness.

Methods

Data source

This study was based on data from the 2008/2009 Canadian Community Health Survey—Healthy Aging (CCHS-HA), a cross-sectional survey that collected information about the factors, influences and processes that contribute to healthy aging. The target population was people aged 45 or older living in private dwellings in the 10 provinces. Residents of the three territories, First Nations reserves, certain remote regions, institutions and Canadian Forces bases, and full-time members of the Canadian Forces were excluded from the survey.

CCHS-HA data were collected from December 2008 through November 2009. Computer-assisted personal interviews were conducted for 94% of the sample; telephone interviews were permitted to accommodate the language needs of respondents. If, because of physical or mental ill health, respondents were unable to complete the survey, another knowledgeable person was allowed to respond on their behalf. Proxy respondents comprise 2.2% of the sample. Response rates were 80.8% (household level), 92.1% (person level), and 74.4% (combined) for a final sample of 30,865 respondents. Further details about the CCHS-HA are available on the Statistics Canada website (www.statcan.gc.ca).

Study sample

This analysis used a sample of 16,369 CCHS-HA respondents aged 65 or older (6,639 men and 9,730 women), whose average age was 77, representing a population of 4.4 million people (Appendix Table A).

Questions in the 3-item loneliness scale were not asked in the 497 proxy interviews; their responses were coded as "not stated" for this module. These respondents contributed to the estimate of incontinence in this study, but not to the bivariate or multivariate analyses.

Definitions

Urinary incontinence was established by asking respondents: "Do you suffer from urinary incontinence?" People were instructed to respond "yes" if their condition had been diagnosed by a health professional and had lasted, or was expected to last, at least six months.

The outcome variable, loneliness, was based on the Revised UCLA Loneliness Scale (R-UCLA).[19] Respondents were asked: "How often do you feel: that you lack companionship? left out? isolated from others?" Values for the response categories (1=hardly ever, 2=some of the time, 3=often) were summed for a total ranging from 3 to 9, with higher scores indicating greater loneliness. Respondents who scored 4 to 9 were categorized as lonely; those whose total equaled 3 (a response of "hardly ever" to all three questions) were categorized as not lonely.

Age was entered as a continuous variable in the multivariate models. In the bivariate analysis, respondents were categorized as younger (65 to 74), middle (75 to 84), or older (85 or older) seniors.

Highest level of household education referred to the highest level attained by a household member, categorized as: less than postsecondary graduation or postsecondary graduation or more.

Living arrangements classified people as living alone or living with others; "others" included spouse, parents, children, and other relatives or non-relatives.

Social support was based on the Medical Outcomes Study Social Support Scale (MOS-SSS),[20,21] which evaluates an individual's perception of the availability of people to help them if needed. The scale is based on 19 questions comprising four subscales, each of which reflects a dimension of social support. All questionnaire items measuring social support use a standard preamble: "How often is each of the following kinds of support available to you if you need it?"

- *Positive social interaction social support* reflects the availability of people for positive interaction, based on four questions about whether the respondent has someone with whom to have a good time, to relax, to get his/her mind off things, and to do something enjoyable. The maximum score was 16.
- *Tangible social support* assesses the availability of someone to provide material and/or behavioural assistance, based on four questions about whether the respondent has someone to help if confined to bed, to take him/her to the doctor, to prepare meals, and to do daily chores. The maximum score was 16.
- *Emotional or informational social support* refers to the expression of positive affect, empathetic understanding, encouragement of expressions of feelings, and offering of advice, guidance or feedback. It is based on eight questions about whether the respondent has someone to listen and to advise them in a crisis, to give information and confide in and talk to, and who understands his/her problems. The maximum score was 32.
- *Affection social support* involves expressions of love and affection, based on three questions about whether the respondent has someone who shows him/her love and affection, who gives hugs, and who makes him/her feel wanted. The maximum score items was 12.

Responses reflecting the perceived availability of support were scored: none of the time (score 1), a little of the time (2), some of the time (3), most of the time (4) or all of the time (5). These were rescaled from 0 to 4, summed for each subscale, and then transformed to a score from 0 to 100 where higher scores corresponded to higher levels of perceived social support. For example, for tangible support: [Score (0-16) / Maximum possible score (16)] x 100. An overall social support score was calculated by summing

the subscale scores and dividing by four so that this value also ranged from 0 to 100.[20] Overall social support was dichotomized; a score of 100 indicated high social support and was compared with those who scored less than 100.

Frequent social participation was defined as participating in community-related activities at least weekly. Respondents were asked how frequently in the past 12 months (at least once a day, at least once a week, at least once a month, at least once a year, never) they participated in eight different activities:

- family or friendship activities outside the household
- church or religious activities such as services, committees or choirs
- sports or physical activities that you do with other people
- other recreational activities involving other people, including hobbies, bingo and other games
- educational and cultural activities involving other people such as attending courses, concerts or visiting museums
- service club or fraternal organization activities
- neighbourhood, community or professional association activities
- volunteer or charity work

Level of disability accounted for the presence and severity of conditions that may exacerbate incontinence (for example, impaired mobility) or have an impact on feelings of loneliness, but were not included in the models. The Health Utility Index (HUI3)[22-24] assessed functional health in eight domains: vision, hearing, speech, mobility, dexterity, cognition, emotion, and pain and discomfort. Overall scores were categorized into levels of disability: moderate/severe disability (0.88 or less) versus no/mild disability (0.89 to 1.00).

Analytical techniques

Data were weighted to represent the age and sex distribution of the 2008/2009 household population aged 65 or older. Cross-tabulations were used to estimate the prevalence of incontinence by sex and age group. Further bivariate analyses estimated the percentage of men and women who reported loneliness, by incontinence and other selected demographic, social and functional health characteristics. To establish whether the relationship of incontinence with loneliness differed by sex, the individual variables with an interaction term (sex*incontinence) were entered into a logistic regression model. Because the interaction term was not significant, and evidence suggests that men and women do not differ in their conception of loneliness as measured with the UCLA loneliness scale,[25] the remaining multivariate analyses were not stratified by sex. In addition, an interaction term between age and incontinence was considered but was not significant. The initial multivariate model examined the association of incontinence with loneliness, controlling for sex, age, and other demographic characteristics. The subsequent model introduced other possible confounders (social factors and functional health). To account for survey design effects of the CCHS, coefficients of variation and p-values were estimated, and significance tests were performed using the bootstrap technique.[26,27] The significance level was set at $p < 0.05$.

Results

In 2008/2009, more than half a million Canadian seniors (12%) reported UI (Table 1). Women were more likely than men to have UI: 14% versus 9%. UI was more common among older seniors; at age 85 or older, 19% of men and 22% of women experienced UI.

An estimated 1.4 million seniors—25% of men and 40% of women—reported feelings of loneliness "often" or "some of the time." Those with UI were significantly more likely to do so: 34% of men and 53% of women with UI were lonely, compared with 24% and 38% of men and women who did not have UI (Table 2).

Other demographic factors associated with loneliness were older age, lower education, and living alone—more than half of the men (54%) and women (53%) who lived alone reported some degree of loneliness (Table 2). Low social support,

Table 1
Number and percentage with urinary incontinence, by sex and age group, household population aged 65 or older, Canada excluding territories, 2008/2009

	Both sexes				Men				Women			
	Estimated number		95% confidence interval		Estimated number		95% confidence interval		Estimated number		95% confidence interval	
Characteristic	'000	%	from	to	'000	%	from	to	'000	%	from	to
Total	**512**	**11.7**	**11.0**	**12.5**	**181**	**9.2**	**8.3**	**10.2**	**331**	**13.8**‡	**12.8**	**14.9**
Age group												
65 to 74†	198	8.2	7.3	9.2	74	6.4	5.4	7.7	124	9.8‡	8.6	11.3
75 to 84	211	14.4*	13.1	15.7	75	11.6*	9.8	13.6	136	16.6*‡	14.8	18.5
85 or older	103	21.0*	18.7	23.5	32	18.7*	15.4	22.6	71	22.3*	19.4	25.5

† reference category
* significantly different from reference category ($p < 0.05$)
‡ significantly different from men ($p < 0.05$)
Source: 2008/2009 Canadian Community Health Survey - Healthy Aging (CCHS-HA).

infrequent social participation, and having a moderate or severe disability were also associated with loneliness.

A preliminary logistic regression model that examined whether the positive association between UI and loneliness was conditional on respondents' sex revealed that the interaction term (sex*incontinence status) was not significant (Figure 1, Appendix Table B). Consequently, for the remaining analyses, responses for men and women were pooled, and sex was controlled for in the multivariate models.

The odds of being lonely were significantly higher for seniors who reported UI than for those who did not, even when age, sex, education and living arrangements were taken into account (Table 3). Consistent with the bivariate analysis, women had higher odds of experiencing loneliness than did men, regardless of incontinence status.

People with low social support, those who participated infrequently in activities with other people, and those with moderate or severe disabilities had higher odds of being lonely (Table 3). When these potentially confounding factors were taken into account, the association between UI and loneliness was attenuated, but remained significant (OR=1.5, 95% CI: 1.3 to 1.7).

Discussion

Range in prevalence estimates

In a review of comparable studies, Thom[30] reported estimates of UI among older community-dwelling adults that ranged from 11% to 34% for men, and from 17% to 55% for women. More recently, the 2002 Canadian Urinary Bladder Survey indicated that 34% of men and 53% of women aged 65 or older reported symptoms of UI.[28] The prevalence of UI in the present study was lower (9% of men and 14% of women aged 65 or older), but these estimates considerably exceed those of a 1996 Canadian study, in which 3% of men and women were reported to have UI.[29] The latter was based on a population aged 55 or older, which may, in part, account for the lower prevalence.

Estimates of UI vary depending on the study population, the type and measurement of UI, survey methodology, and other factors.[28,30,31] Respondents to the CCHS-HA were asked to report diagnosed UI. Studies show that people frequently do not discuss UI with their health care providers,[32,33] especially if the symptoms are relatively mild, so the requirement of a diagnosis may result in an underestimate of the number of people who actually experienced involuntary loss of urine. Further, the use of informal, self-explanatory phrases, such as "unable to hold your water" and "wet yourself,"[32,34] may elicit more affirmative responses, resulting in a higher prevalence than the term "incontinence," which was used in the CCHS-HA and the earlier Canadian study.[29] Question format may also be a factor; the CCHS-HA question was short and direct ("Do you suffer from urinary incontinence?"), but others have provided more context. Fultz and Herzog[34] found that an introduction that acknowledged potential embarrassment surrounding UI and a question follow-up that stressed the importance of collecting the information resulted in a higher prevalence than did questions without this context. Different timeframes can also affect prevalence estimates: the CCHS-HA asked about conditions that had lasted or were expected to last at

Table 2
Percentage reporting loneliness, by sex, urinary incontinence and selected characteristics, household population aged 65 or older, Canada excluding territories, 2008/2009

	Men			Women		
		95% confidence interval			95% confidence interval	
Characteristic	%	from	to	%	from	to
Total	25.2	23.6	26.8	40.0‡	38.4	41.5
Urinary incontinence						
Yes	33.5*	28.7	38.8	53.2*‡	49.4	57.0
No†	24.3	22.8	26.0	37.9‡	36.2	39.6
Demographic characteristics						
Age group						
65 to 74†	24.0	22.0	26.0	38.2‡	36.0	40.5
75 to 84	25.8	23.1	28.6	40.8‡	38.4	43.2
85 or older	31.7*	27.5	36.3	45.0*‡	41.5	48.6
Highest level of household education						
Less than postsecondary graduation	28.6*	26.3	31.1	42.7*‡	40.5	45.0
Postsecondary graduation†	22.7	20.7	24.8	37.5‡	35.3	39.7
Living arrangements						
With others†	18.9	17.2	20.6	31.5‡	29.3	33.9
Alone	54.2*	51.1	57.3	52.6*	50.5	54.6
Social characteristics						
Social support						
High (score of 100 on total social support scale)†	12.7	10.6	15.1	21.2‡	18.7	24.0
Low	33.0*	30.9	35.2	46.6*‡	44.7	48.5
Social participation						
Frequent (at least once/week)†	22.9	21.3	24.7	36.3‡	34.6	38.1
Infrequent	31.7*	28.6	34.9	51.9*‡	48.4	55.4
Functional health						
No/Mild disability†	19.6	17.9	21.3	30.3‡	28.3	32.4
Moderate/Severe disability	33.0*	30.3	35.8	50.6*‡	48.3	52.9

† reference category
* significantly different from reference category ($p < 0.05$)
‡ significantly different from men ($p < 0.05$)
... not applicable
Source: 2008/2009 Canadian Community Health Survey - Healthy Aging (CCHS-HA)

least six months, while other studies referenced the past year, month or other time periods.[32]

More common among women and elderly

The higher prevalence of UI among women than men in the CCHS-HA is consistent with earlier studies.[28,29,33] Factors over the life course such as pregnancy and vaginal delivery may contribute to this difference.[35] The finding that UI was more common at older ages was consistent with most,[21,36,37] but not all,[32] studies. The general question used in the CCHS-HA did not allow identification of subtypes of incontinence, which potentially masks different age trends. Studies have shown that urge and mixed incontinence increase with advancing age, but the prevalence of stress incontinence has a bell-shaped relationship with age.[37,38]

Association with loneliness

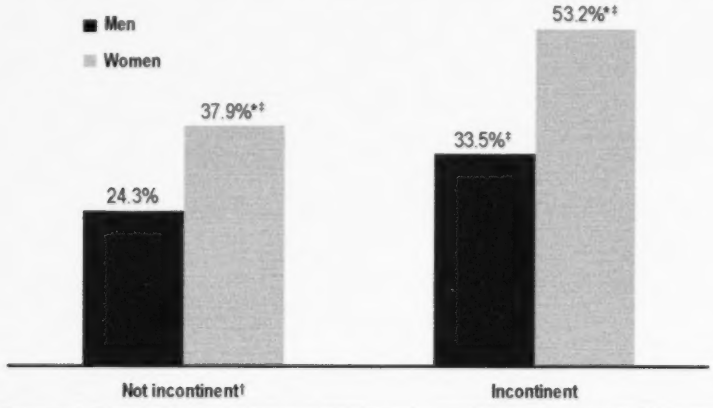
UI is among the chronic conditions with the greatest functional impact.[39,40] The majority of studies that examined the social impact of UI focused on women. Results of studies that included both sexes were inconsistent—some reported greater social impacts among men,[8,41,42] while others found no differences.[43,44] In this analysis, the interaction term that examined whether the relationship between UI and loneliness differed by sex was not significant, adding to the evidence that the social impact, at least in terms of loneliness, was similar for both sexes.

The association between UI and loneliness was attenuated, but persisted, when frequency of social participation, availability of social support and level of disability were taken into account. An earlier study found a similar association between UI and loneliness,[8] although the measures differed, and that study did not control for living arrangements, social support or social participation.

The mechanisms behind the independent association between UI and loneliness are not clear. In a longitudinal study, de Vries[45] found that the functional loss related to UI (avoiding social, shopping, physical and travel activities), not the UI itself, was associated with new psychological distress. The results of this study are not consistent with those of de Vries, since a significant association between UI and loneliness persisted when potential functional loss was taken into account via indicators of social participation and disability. However, differences in the measures of incontinence and outcomes, absence of information about condition-specific impacts, and the cross-sectional nature of this study may, in part, account for this inconsistency.

Seniors with UI may remain socially active by modifying their activities to accommodate the condition. However, whether they are satisfied with their level of social participation and whether dissatisfaction leads to feelings of loneliness are unanswered questions. Emotions potentially associated with UI such as shame and lowered self-confidence, self-esteem and sense of control were

Figure 1
Percentage lonely, by sex and urinary incontinence, household population aged 65 or older, Canada excluding territories, 2008/2009



† reference group
* significantly higher than men ($p < 0.05$)
‡ significantly higher than not incontinent ($p < 0.05$)
Source: 2008/2009 Canadian Community Health Survey - Healthy Aging (CCHS-HA).

What is already known on this subject?

- Population-based studies have shown that urinary incontinence (UI) is prevalent among community-living seniors, although estimates vary widely. Women and older seniors are most likely to experience UI.
- UI among seniors has been associated with loss of independence, increased personal care expenses, and reduced social interaction and psychological well-being.

What does this study add?

- More than half a million Canadian seniors (12%) experienced UI in 2008/2009, according to results from the Canadian Community Health Survey-Healthy Aging.
- Men and women with UI had higher odds of being lonely than did seniors without this condition, even when demographic, social, and functional health characteristics were taken into account.
- Although the prevalence of UI was higher among women, the association between UI and loneliness was similar for both sexes.

not measured in this study, but may contribute to feelings of loneliness.

Limitations

Because of the cross-sectional design of the CCHS-HA, the temporal order of UI and loneliness could not be established in this study. However, longitudinal evidence[45] supports the direction of the relationship between UI and psychosocial outcomes.

The CCHS-HA targeted the household population and excluded residents of institutions. Consequently, the study results do not represent all seniors, just the subpopulation who live in private households.

Incontinence was self-reported in the CCHS-HA and not verified by physical examination, physician records, or any other source; thus, the extent of reporting error is unknown. Respondents were asked to report UI that had been diagnosed by a health professional. Those who experienced involuntary leakage, but had not received such a diagnosis, may not have reported UI, which would lower the prevalence estimate. It is not known how respondents who are undergoing medical treatment or who have had surgical correction for UI would answer the CCHS-HA question: "Do you suffer from urinary incontinence?"

Evidence suggests that UI is underreported and under-diagnosed. This may be because of embarrassment, because the condition does not interfere with activities, because it is seen as a normal part of aging, lack of screening, or other reasons.[13,31,32,46,47] The resulting misclassification would reduce the estimated prevalence of UI and may have an impact on the association with loneliness. Information about the severity of UI (for example, frequency, amount of leakage, and use of absorbent products[13,48]) was not collected by the CCHS-HA, and therefore, could not be controlled for in the multivariate models. Nor did the CCHS-HA include information on subtypes of UI (for example, stress UI, urge UI), which may have different pathophysiologies, and thus, different relationships with age and quality of life.[49]

Respondents who relied on proxy interviews contributed to the estimate of UI, but not to the analyses involving loneliness. Because people who relied on proxy interviews were significantly more likely to have UI (19.9%) than were people who did not (11.5%), the overall estimate of incontinence was marginally higher (11.7%) when the former were included.

Table 3
Adjusted odds ratios relating urinary incontinence to loneliness, adjusting for selected characteristics, household population aged 65 or older, Canada excluding territories, 2008/2009

	Restricted[2] model			Full[3] model		
		95% confidence interval			95% confidence interval	
Characteristic	Adjusted odds ratio	from	to	Adjusted odds ratio	from	to
Urinary incontinence						
Yes	1.8*	1.5	2.0	1.5*	1.3	1.7
No†	1.0	..	..	1.0	..	..
Demographic characteristics						
Sex						
Women	1.6*	1.4	1.7	1.5*	1.3	1.7
Men†	1.0	..	..	1.0	..	..
Age (continuous)	1.00	0.99	1.00	0.99*	0.98	1.00
Education						
Less than postsecondary graduation	1.0	0.9	1.1	1.0	0.8	1.1
Postsecondary graduation†	1.0	..	..	1.0	..	..
Living arrangements						
With others†	1.0	..	..	1.0	..	..
Alone	3.1*	2.7	3.5	2.8*	2.4	3.2
Social characteristics						
Social support (dichotomous)						
High (score of 100 on total social support scale)†	..	..	..	1.0	..	..
Low	..	..	..	2.5*	2.2	2.9
Social participation						
Frequent (at least once/week)†	..	..	..	1.0	..	..
Infrequent	..	..	..	1.5*	1.3	1.8
Functional health						
No/Mild disability†	..	..	..	1.0	..	..
Moderate/Severe disability	..	..	..	2.0*	1.7	2.2

† reference category
* significantly different from reference category ($p < 0.05$)
‡ adjusted for demographic characteristics
§ adjusted for demographic characteristics, social characteristics, and functional health
.. not applicable
Source: 2008/2009 Canadian Community Health Survey - Healthy Aging (CCHS-HA).

Conclusion

This study highlighted the association between UI and loneliness. The results suggest that addressing UI could reduce loneliness, and thereby, have a positive impact on the quality of life of affected seniors.[50-52] Treatments include behavioural, pharmacological and surgical interventions.[35]

Research that examines additional psychological and emotional characteristics in relation to UI and loneliness is needed to enhance understanding of this complex relationship. Longitudinal studies are also required to establish the temporal order of onset and reduction/elimination of UI symptoms in relation to loneliness and other quality-of-life outcomes. ■

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Appendix

Table A
Study sample and percentage distribution of selected characteristics, household population aged 65 or older, Canada excluding territories, 2008/2009

	Sample	Population estimates	
Characteristic	Number	'000	%
Total	16,369	4,366.1	100.0
Sex			
Men	6,369	1,969.9	45.1
Women	9,730	2,396.2	54.9
Age group			
65 to 74	6,975	2,407.2	55.1
75 to 84	5,320	1,468.1	33.6
85 or older	4,074	490.8	11.2
Urinary incontinence			
Yes	2,302	511.7	11.7
No	14,058	3,853.2	88.3
Lonely			
Yes	5,977	1,396.1	33.3
No	9,684	2,797.5	66.7

Note: Because of missing data, detail may not sum to total.
Source: 2008/2009 Canadian Community Health Survey - Healthy Aging (CCHS-HA).

Table B
Adjusted odds ratios relating sex and urinary incontinence to loneliness, household population aged 65 or older, Canada excluding territories, 2008/2009

	Without interaction			With interaction		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to
Women	1.9*	1.8	2.1	1.9*	1.7	2.1
Incontinent	1.8*	1.5	2.0	1.6*	1.2	2.0
Interaction	..	..	..	1.2	0.9	1.6

* significantly different from 1.0 ($p < 0.05$)
.. not applicable
Source: 2008/2009 Canadian Community Health Survey - Healthy Aging (CCHS-HA).